

Terrestrial Study Category, Appendix E

Study Topic	File Date
Terrestrial Plant (Spring Herbs, Woody Plants) Populations of Forested and Reclaimed Sites	03/2003
Terrestrial Vertebrate (Breeding Songbird, Raptor, Small Mammal, Herpetofaunal) Populations of Forested and Reclaimed Sites	9/2002
Soil Health of Mountaintop Removal Mines in Southern West Virginia	1/2001
Soil and Forest Productivity	10/2002, presented in Chapter III.B.4
Bird Populations Along Edges	5/2002

These reports are included in the appendix in black and white. Color versions may be viewed on the following website. <http://www.epa.gov/region3/mtntop/index.htm>

Terrestrial Plant (Spring Herbs, Woody Plants) Populations of Forested and Reclaimed Sites by Dr. Steven N. Handel of the Department of Ecology, Evolution, and Natural Resources of Rutgers University

The objective of this study was the following:

To determine the patterns of terrestrial vegetation on areas affected by MTM/VF and on adjacent, non-mined areas in order to understand the potential for re-establishment of native vegetation.

Researchers used 55 transects from mine sites examined in southern West Virginia ranging in age from 8 to 26 years since revegetation. Even on the oldest sites, invasion of native tree species onto reclaimed mines from adjacent forests was minimal, and restricted to the first several meters from the adjacent forest edge. The study supports the conclusions of other researchers that past mining reclamation procedures limited the overall ecological health and plant invasion of mined sites, and that these lands reclaimed in this manner will take much longer than observed in old field succession to return to pre-mining forest vegetation. Less soil compaction, smaller mine areas, establishing healthy soil profiles, less aggressive grass covers along with salvaging and redistributing native plant material would support the return of a healthier ecosystem, although pre-mining biodiversity may be difficult to achieve.

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The mined areas studied were not designed, engineered, reclaimed or revegetated with a post mining land use (PMLU) of forest (commercial or otherwise). The questions remains what effect the reforestation initiative recently started will have on reestablishing a healthy forest ecosystem. Past reclamation practices have impeded returning these areas to forests, and without changes in these practices, existing forest would be converted to grasslands for many years.

Terrestrial Vertebrate (Breeding Songbird, Raptor, Small Mammal, Herpetofaunal)
Populations of Forested and Reclaimed Sites by Drs. Petra Wood and John Edwards of West Virginia University

This study evaluated wildlife use of reclaimed mountaintop mining sites compared to intact forest habitat in southern West Virginia. The objectives of the study are as follows:

Quantify the richness and abundance of the wildlife community in relatively intact forest sites of the pre-mining landscape and in the grassland, shrub/pole, and fragmented forest sites of the post-mining landscape to provide objective data on gains and losses in terrestrial wildlife communities. Specifically, for species that require forested habitats, compare the abundance of species in intact and fragmented forests. Quantify nesting success of grassland birds on the reclaimed grassland sites because grassland birds are declining in the U.S. due partially to the loss of habitat, and there has been the suggestion that these newly created grasslands are providing important habitat for grassland species.

Four different habitat types were evaluated: 1) grasslands and 2) shrub/pole habitats on reclaimed mines, 3) fragmented forests predominantly surrounded by reclaimed land, and 4) large tracts of intact forest (to represent what would have been present before mining). The number of bird species and the abundance of birds were highest in shrub/pole habitats on the mines since the mix of habitat conditions provided more niches for greater bird diversity. Shrub/pole habitats were dominated by bird species that typically use “edge” habitats. Golden-winged warblers, a species of concern known to use shrub habitat created by contour mines, were observed at only three stations (out of 33 shrub/pole stations), all on the Cannelton mine. Grassland habitats were dominated, by grassland bird species such as grasshopper sparrows and meadowlarks. Forest-interior bird species were significantly more abundant in intact forest than in any other habitat type; the cerulean warbler, a species of concern, occurred at higher densities in intact forests in the study area than has been reported from other locations in West Virginia. The report concluded that populations of forest birds may be adversely affected by the loss and fragmentation of mature forest habitat in the mixed mesophytic forest region, which has the highest bird diversity in forested habitats in the eastern United States. Fragmentation-sensitive species such as the cerulean warbler, Louisiana waterthrush, worm-eating warbler, black-and-white warbler, and yellow-throated vireo will likely be negatively impacted as forested habitat is lost and fragmented from mining. Extensive areas of grasslands are not natural habitats in the study area, and most of the grassland bird species that use the reclaimed mines have extensive

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breeding areas in North America. In contrast, some of the forest interior species that disappear after mining have small geographical ranges, and the core of their geographic range is centered on the forests of the study area.

Raptors were found to use the various habitats as would be expected depending on habitat requirements of each species. Species richness of small mammals did not differ between the four habitat types. Reclaimed grassland habitats may produce more *Peromyscus* spp. (white-footed and deer mice). The Allegheny woodrat, a species listed as threatened/endangered in nine states including Virginia and West Virginia, was present in ten out of 20 riprap drainage channels surveyed on two different mines; however, woodrat habitat in intact forests was not surveyed so a comparison of woodrat abundance on reclaimed mines vs. intact forests cannot be made. Abundance and richness of herpetiles did not differ significantly between the four habitat types, but a shift was observed from a majority of amphibian species in the two forested habitat types to a majority of reptile species on the reclaimed areas. In particular, salamanders decreased while snakes increased.

The study answered questions related to the effects of mountaintop mining on wildlife and their habitats, including species of concern. The researchers were not asked to evaluate game species. Although this is not a shortcoming from the standpoint of understanding the ecological implications of mountaintop mining (most game species are generalists and, therefore, poor indicators of ecological health) some may see this as an issue.

Bird Populations Along Edges by Dr. Ron Canterbury of the Department of Biology, Concord College

Shrub/forest edges were used by more forest interior bird species, interior-edge species, and edge species than other edge habitat types. Grassland birds were more abundant at edges between grasslands and fragmented forests than at other edge types. Forest interior birds generally declined in grassland/forest fragment edges as opposed to grassland/intact forest edge. This study was designed to evaluate the following characteristics:

Specific habitat areas on mines and seasonal use of habitats by birds to fill in data gaps about bird use of mountaintop removal mines and edge habitats on the mines to determine the extent to which they are used by birds.

Canterbury also documented winter use of habitats. American crows and dark-eyed juncos were the most abundant species observed in winter. Blue jay, Carolina chickadee, pileated woodpecker, sharp-shinned hawk, tufted titmouse, white-breasted nuthatch, and yellow-bellied sapsucker were more abundant in forest interior than in edge locations. European starlings, eastern bluebirds, eastern meadowlarks, and horned larks were abundant in mine grassland and shrub habitats.

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During the spring migration period, mine grasslands were used by European starlings, turkey vultures, eastern meadowlarks, and tree sparrows. Field sparrows were the most common species observed in shrub habitats. Red-eyed vireos and wood thrushes were the most abundant migrants in forested habitats. During the fall migration season, no long-distance migrant that does not breed in the area was noted on mine grasslands; however, the migration counts were terminated early due to deadlines in the EIS process. The white-eyed vireo was the most abundant fall migrant in shrub habitats, while the Carolina chickadee was the most abundant fall migrant in forested habitats.

The study addresses another aspect of the effects of mountaintop mining on wildlife and their habitats. Bird use of mines during fall migration may not have been fully characterized, as migration counts were terminated early due to EIS deadlines.

Soil Health of Mountaintop Removal Mines in Southern West Virginia by John Sencindiver, Kyle Stephens, Jeff Skousen, and Alan Sexstone of West Virginia University

This study, was designed to evaluate physical, chemical, and microbiological properties of minesoils developing on reclaimed mountaintop removal coal mines in southern West Virginia. Minesoils of different ages and the contiguous native soils were described and sampled on three mines. Routine physical and chemical properties were determined as well as microbial biomass C and N, potentially minerizable N, and microbial respiration. All minesoils were weakly developed compared to native soils, but most had a transition horizon (AC) or a weak B horizon developing. The authors concluded that the minesoils are approaching stable, developed soils and should become more like the native soils as they continue to develop.

The study does not attempt to answer questions such as how long it might take the mined soils to become like native soils.